User Manual

iSense Methane, Carbon Dioxide & Oxygen Biogas Meter & Sampling Data Logger

CM-0200

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Welcome

Thank you for purchasing our meter. This fixed-mount meter allows you to measure carbon dioxide, oxygen and methane easily and accurately.

Inside the unit is a precision micro-pump connected to two tubing ports on the side of the unit. When the unit is turned on, the pump draws gas from one tube port and expels it from the other. By connecting tubing to the inlet, you can remotely sample gas. By connecting tubing to both ports, you can create a closed-loop system and return the gas back to the original container. This makes the meter perfect for measuring high concentrations of CO_2, CH_4 and O_2 in biological applications like biogas.

This meter can

- Take readings automatically and save them to memory

- Display changing gas levels in real time

The model is capable of reading from 0-50% CO_2, 0-100% CH_4 and 0-25% O_2.

Also include a data cable setup and for optional tethered data logging. The backlit LCD can be programmed to changes color according to gasses levels.

Please take some time to read through this manual in order to get the most out of your meter. Make sure to visit our website regularly to find more information about this product and to download the DAS software free. Once you download and install the DAS software, you can use the "Check for updates" function under the *Help* menu to search for new updates. Please also pay special attention to the important safeguards shown on the pages ahead.

Important Safeguards

To reduce the risk of fire, electrical shock and/or injury to persons, basic safety precautions should always be followed when using electrical appliances, including the following:

1. READ ALL INSTRUCTIONS BEFORE USING THIS DEVICE.
2. Use only the supplied power supply to operate the unit.
3. Ensure that when sampling in a closed environment that the tubes are securely fashioned to the device.
4. Do not operate with a blocked off sample path.
5. Do not operate the device if it is malfunctioning.
6. Do not operate the device with the cover detached.

SAVE THESE INSTRUCTIONS!

Device Specifications

Measuring Range	
CO2	0-500,000 ppm (50%)
CH4	0-1,000,000 ppm (100%)
O2	0-25%
Accuracy	±3% at > 50% of range value
	±5% at < 50% of range value
Memory	15,000 data points saved
Power Supply:	
Maximum Voltage	30 VDC
Minimum Voltage	18 VDC
Power Consumption	~100 mA avg. (pump running)
Sensor Ratings:	
Life Expectancy	> 15 years
Maintenance Interval	No maintenance required
Warm-up Time	< 1 min (instant measurements)
Pump Characteristics:	
Maximum Flow (STP)	0.80 liters/min
Maximum Vacuum	-400 mbar
Maximum Pressure	370 mbar
Maximum System Pressure	~1 Atm

Package Contents

Please verify that your package contains the following items before using the meter:

All units:

- (1) Meter
- (1) RS-485 to USB Cable M12 12 Pin with Power (CM-0182)
    - Includes 110-220VAC International Power Supply
- (1) 6-foot USB Cable
- (1) User manual
- (1) 10-foot length 1/8" tubing
- (2) 1/8" Barb tubing bulkhead fitting
- (2) 1/8" Barb 10-32 fittings
- (2) Particle Filter (CM-0118)
- (2) Hydrophobic Filter (CM-0117)
- (2) Moisture Trap (CM-0112)
- (1) Extreme Moisture Filter (CM-0103)

Optional Accessories

You can purchase Extreme Moisture Filter Replacement Filters separately. These filters are ideal for high-humidity environments to allow air flow while keeping humidity out. Use anywhere humidity is very high (> 95%). SKU # CM-0103-F

Data Acquisition System (DAS) Software

Visit CO2Meter.com and go to the "Downloads" page to download our DAS software. Also online is an instructional video to connect, configure, and calibrate your meter. For general information about the program, please see the *DAS User Instruction Manual* located in the website below.

http://www.co2meter.com/pages/downloads

<u>IMPORTANT</u>: MAKE SURE TO INSTALL SOFTWARE BEFORE CONNECTING YOUR DEVICE TO YOUR COMPUTER

By installing our DAS software first, you will ensure that the proper driver necessary for your unit is installed on your computer before connecting your meter. Click on the "Install Now" link and then select "Run" when prompted by your browser (as shown on Figure 1 below).

Minimum System Requirements

To utilize our free software, your computer must meet the following requirements:

- Windows XP SP3 or higher
- Microsoft .Net Framework 3.5 SP1
- Pentium 4 (or newer) operating at 2.4Ghz or faster
- 1GB of Random Access Memory (RAM)
- Hard disk space with at least 20 Megabytes (MB) free (200+MB recommended for logs and application files)

Software is compatible with 64-bit operating systems and is fully tested with Windows 7.
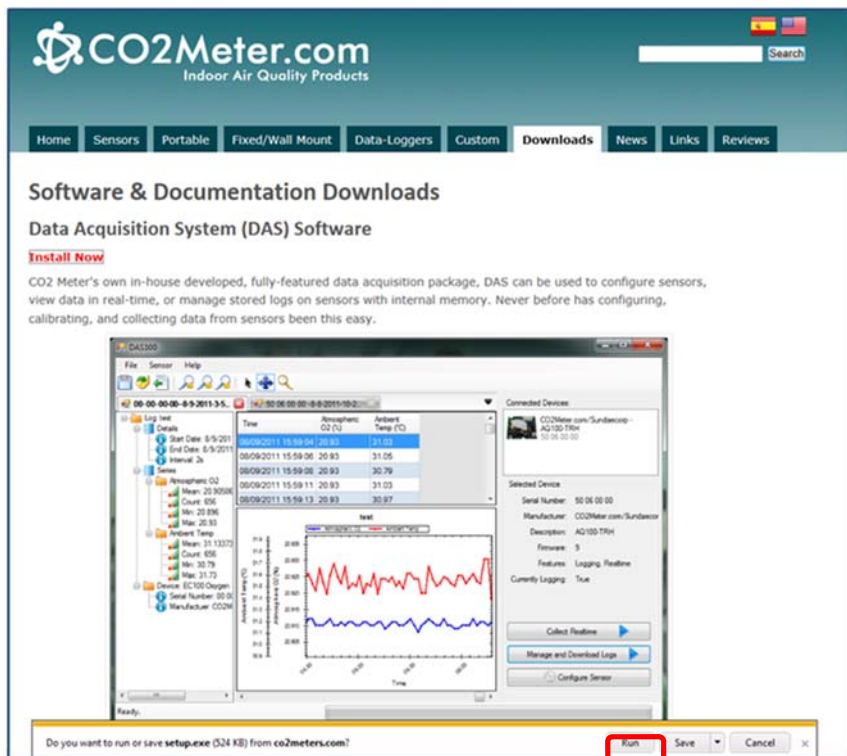
Figure 1: Install DAS online (Internet Explorer 9 shown)

Quick Start Guide

Make sure you read through these instructions thoroughly before using your meter. This guide will help you to familiarize yourself with all the features in order to be as productive as you need to be in the least amount of time possible.
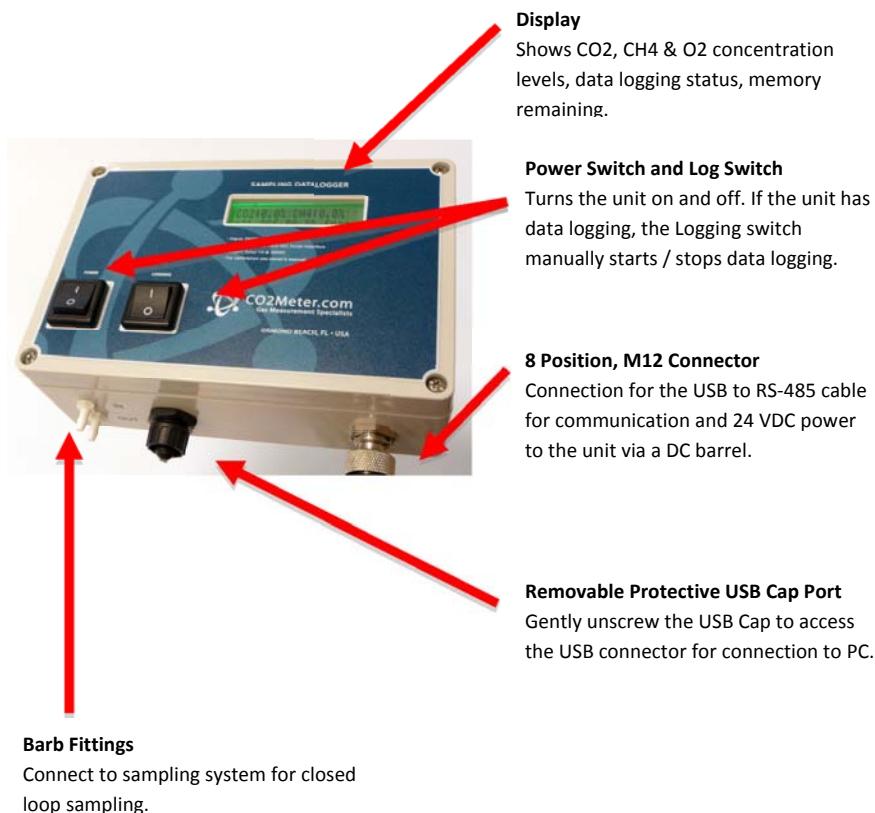
Display
Shows CO2, CH4 & O2 concentration levels, data logging status, memory remaining.

Power Switch and Log Switch
Turns the unit on and off. If the unit has data logging, the Logging switch manually starts / stops data logging.

8 Position, M12 Connector
Connection for the USB to RS-485 cable for communication and 24 VDC power to the unit via a DC barrel.

Removable Protective USB Cap Port
Gently unscrew the USB Cap to access the USB connector for connection to PC.

Barb Fittings
Connect to sampling system for closed loop sampling.

Figure 2: Components

Power Source

All units can be powered by the included 24VDC International wall power supply.

Setup

By default, the meter only requires installation and power for setup. When powered on and logging turned on, after approximately 60 seconds it will display the current ambient CO_2, CH_4 and O_2 levels from the air inlet. Note that because indoor air is normally less than 400 ppm CO_2, by default the unit will show low level readings (10,000ppm = 1%).

Sampling-Only

In sampling mode, the unit can be used to sample closed-loop CO_2 & CH_4 gas and optionally collect real-time data.

There is no initialization required. In stand-alone mode, plug in the power, and turn the unit on. Turn sampling off. After 60 seconds, the levels will be shown on the LED display. While sampling, the meter may also be connected to a personal computer and used with our DAS software to log data samples in real-time.

Data Logging

The meter has internal memory capable of storing up to 15,000 data points when not attached to a personal computer. You can view and store CO_2, CH_4 and O_2 levels at the same time Due to the nature of their design, these units should be connected to your personal computer before operation to initialize and set the logging period, and to set the real-time clock.

To start, plug in the USB cable In order to initialize data logging functionality, the unit MUST be connected to the computer with data logging switched to *off*, and the DAS software started. Once the unit has been connected, click on the "Configure Sensor" button in the DAS

interface, set the data logging interval and pump periods as desired. We recommend leaving the pump interval to the default 10-second period.

For the pump period, we recommend 10 or more seconds. Figure 2 below shows the available settings.
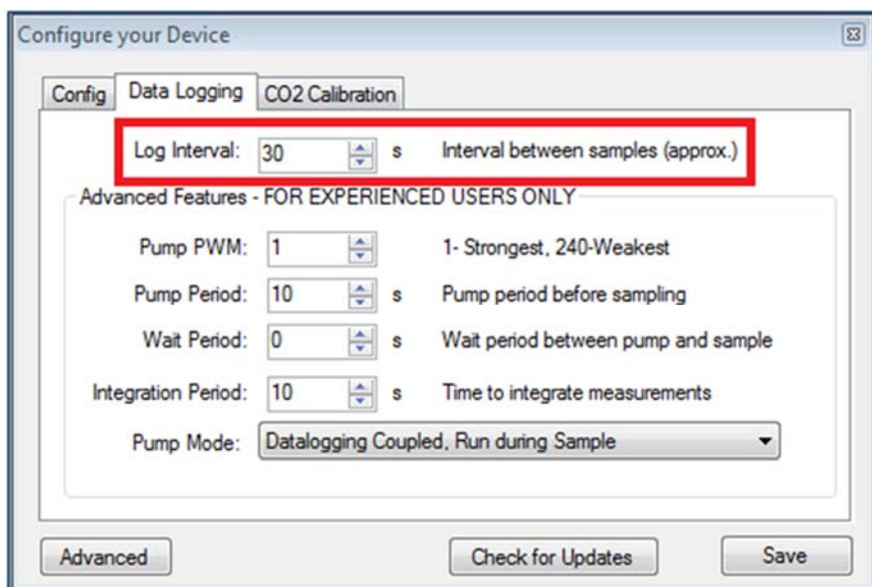

Figure 2: Pump & Data Logging Settings

The pump PWM period can also be tweaked for advanced applications, with 1 being full duty cycle, and values approaching 255 being the shortest duty cycle. The pump mode should always be set to "Data logging" for proper operation of the unit.

All models have an internal coin cell CR-2032 3V battery backup for the real-time clock. This battery is inserted in the factory for your convenience and should last the lifetime of the product.
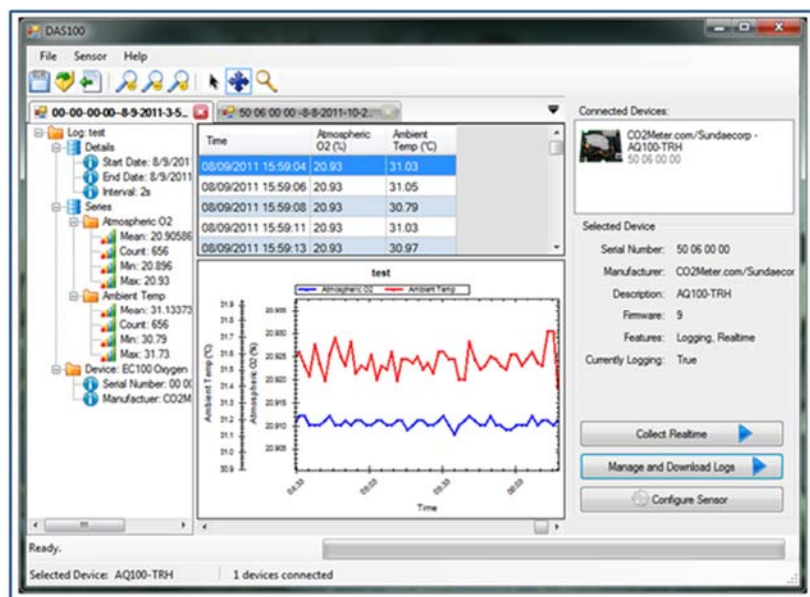
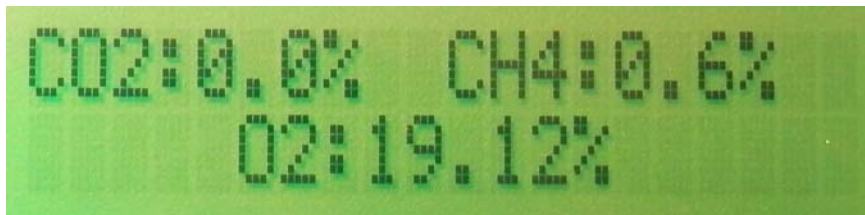*Figure 3: Collecting data in real time*

Powering the Unit

These meters can be powered by the included power supply. These units **CANNOT** be powered from the included USB cable. Testing has shown that USB power tends to produce inconsistent supply voltage and degrades sensor accuracy.

CM-0200 data loggers turn themselves on and off as required to log data. The switch on the front enables/disables data logging. As long as the unit has the power adapter is connected, the unit will operate. If the unit is not going to be used for an extended period of time, turn the Power and Logging switch off.

LCD Display (if applicable)

The Liquid Crystal Display (LCD) screen shows the following features:

- CO2 in percentage format (##.#%) for 50%
- CH4 in percentage format (##.#%) for 100%
- O2 in percentage format (##.##%) for 25%

Usage (Pump only)

To use the unit, for sampling, tubing must be attached to the inlet and outlet fittings on the front of the unit. The pump will draw air from the inlet in a vacuum configuration, push it through the sensing chamber, and exhaust the air out through the outlet. 2 sizes of tubing ports are included depending on your tubing ID size.
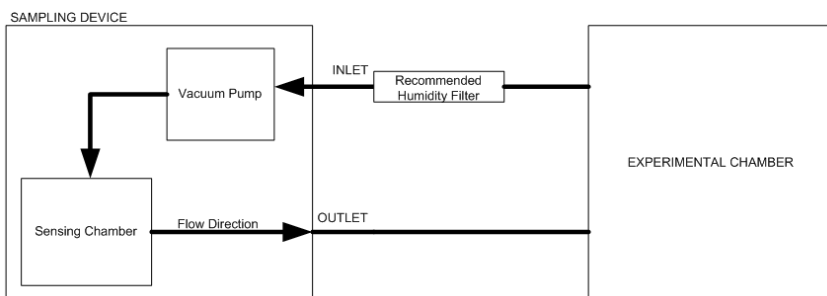
Closed Loop Operation

Figure 4: Closed loop sampling setup
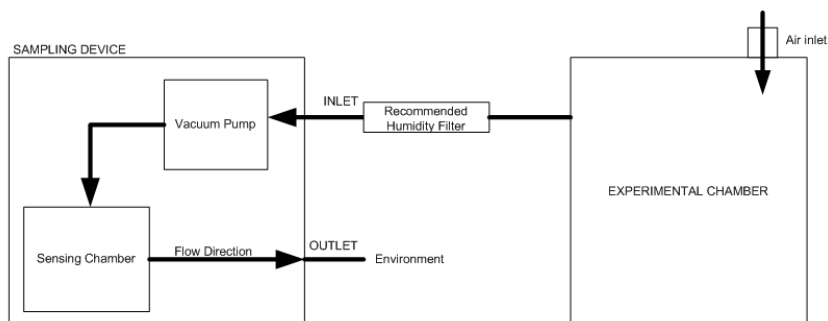
Open Loop with Environmental Exhaust

Figure 5: Opened loop sampling setup

We recommend installing the included humidity/particulate filter to ensure the sensing chamber and pump baffle stays clear and corrosion free.

Theory of Operation

The CO_2, NH_4 and O_2 sensors inside this device use non-dispersive infrared technology to sense, as a function of transmitted light, the concentration of gases in the air. It has been factory-calibrated to operate within the specified range and precision.

Calibration

The calibration of the oxygen sensor in the CM-0200 is not necessary. The Oxygen sensor is calibrated on manufacture process. Users will not need to calibrate the O_2 sensor. All units are factory-calibrated with multiple reference points of gas, and have been verified to be accurate within their specific functionality before shipment. However, if the unit is severely jolted or otherwise mechanically disturbed, the sensor can drift requiring recalibration. All calibration procedures follow a single-

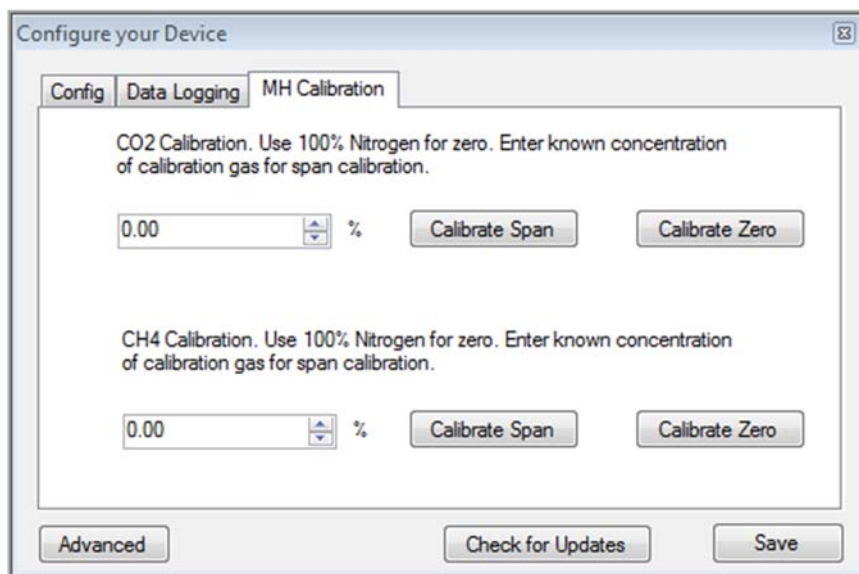point calibration routine that effectively shifts the zero-point of the sensors.

Figure 6: Sampling calibration screen for 50% CO2 &100% CH4

Calibration can be performed using either 0% calibration gas (typically nitrogen, Argon, etc.), or using a fresh source of air, assumed to be approximately 400ppm CO2 and 0% CH4. Attach calibration gas to the unit and connect the unit to a personal computer. Open the calibration screen in the DAS software. Click the "Calibrate" button in the calibration tab for the desired gas, located in the "Configure Sensor" screen. As long as the gas concentration is stable, the unit should instantly reflect the calibrated value. This can be confirmed by watching the display. To see the calibration value in real time, click in the "Collect Real time" button to capture these values before opening the configuration screen.
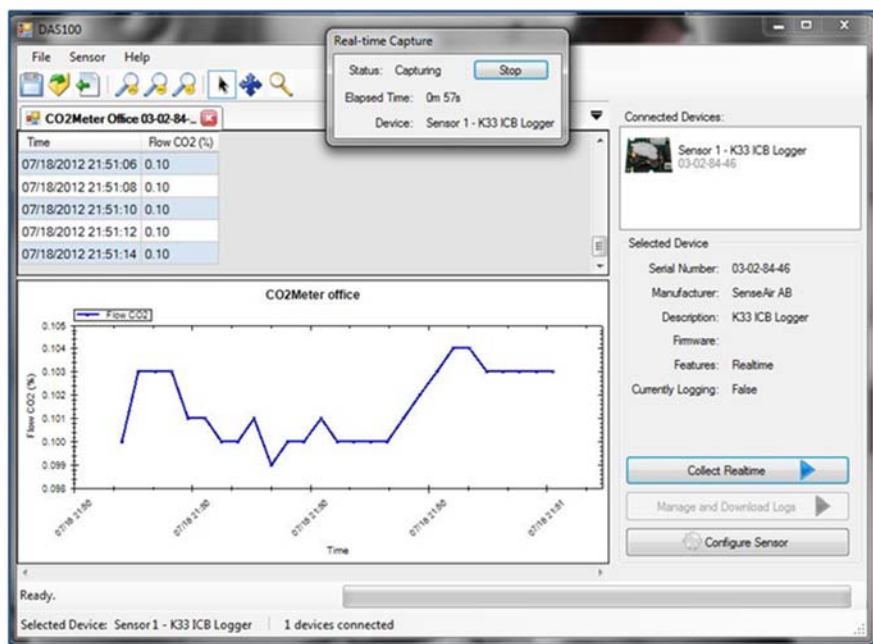
Figure 7: Real-time capture

Open the calibration screen in the DAS software. Click the "Calibrate" button in the calibration tab, located in the "Configure Sensor" screen.

Calibration Procedure

To calibrate your unit, follow these steps:

1. Expose the unit to ambient air (assumed to be at 400ppm) or connect it to a calibration gas bottle/cylinder (100% nitrogen or argon) with the appropriate demand regulator.

2. Wait 25 seconds to collect a sample. Write down this value as the "before" value.

3. Click the "Calibrate" button after selecting your calibration gas.

4. Wait 25 seconds again. This time, the unit will take a sample and use this data to adjust zero values. The displayed measurements will reflect the new calibration value (0 or 400ppm).

5. Disconnect the Calibration gas and wait 25 seconds. The newly displayed data will now reflect the new sensor calibration. If the sensor is still operating outside of its specified range, repeat this procedure. When the readings vary too greatly, the calibration will silently fail and may need to be performed again.

To perform a calibration, attach the unit to your computer, power it with the wall adapter and either expose it to atmosphere or supply it with your calibration gas, fed with a demand-based regulator.

Open the DAS software on your personal computer and click the "Configure Sensor" button. For data logging units, click the "Turn Pump on Continuously" button to ensure continuous flow. (To apply any change has to power cycle the unit)

Zero or Fresh Air Calibration
Apply gas and select the appropriate concentration in the screen shown in Figure 10. Click the "Calibrate" button. The sensor reading should instantly reflect the calibration.

High-Concentration Calibration
Write down the original Zero Value before adjustment for future reference. Apply the desired concentration calibration gas; adjust the Zero Value in increments of 10 pressing the large "Save" button on the right until the unit displays the correct concentration.

NOTE: DO NOT ADJUST THE SPAN VALUE.

Troubleshooting guide

Symptom / Issue	Possible Cause / Resolution
Device/Sensor is not recognized by PC	Your device's batteries might be depleted. Replace the batteries with fresh ones, or if applicable, connect the device to the included power supply.
Device doesn't power ON	Make sure the power adapter is plugged properly and that there is power in the outlet the adapter is connected has the appropriate voltage. If using batteries, make sure they are not depleted.
The DAS software doesn't start *	Your software might be out of date. Update your software by either visiting our download webpage at http://www.co2meter.com/pages/downloads or by selecting the "Check for Updates" under the *Help* menu. Make sure your PC meets the minimum requirements.
Slow response	Check the air flow channels to make sure they are not obstructed.
Reading doesn't change	Make sure the meter is in maximum or minimum mode.
"Bat" and green LED keep flashing	The power adapter output voltage is inappropriate. Please use the power adapter with correct 5V (±10%), ≥0.5A.

*For more troubleshooting tips on DAS software, see DAS manual located at www.co2meter.com/pages/downloads.

Support

The quickest way to obtain technical support is via email. Please send all support enquires to *support@co2meter.com*. In your email, please include a clear, concise definition of the problem and any relevant troubleshooting information or steps taken so far, so we can duplicate the problem and quickly respond to your inquiry.

Warranty

This unit comes with a 1YEAR (warranty period) limited manufacturer's warranty, starting from the date the unit was shipped to the buyer.

During this period of time, CO2Meter.com warrants our products to be free from defects in materials and workmanship when used for their intended purpose and agrees to fix or replace (at our discretion) any part or product that fails under normal use. To take advantage of this warranty, the product must be returned to CO2Meter.com at your expense. If, after examination, we determine the product is defective, we will repair or replace it at no additional cost to you.

This warranty does not cover any products that have been subjected to misuse, neglect, accident, modifications or repairs by you or by a third party. No employee or reseller of CO2Meter.com's products may alter this warranty verbally or in writing.

Returns

If the product fails under normal use during the warranty period, an RMA (Return Material Authorization) number must be obtained from CO2Meter.com. After the item is received, CO2Meter.com will repair or replace the item at our discretion.

To obtain an RMA number, please call CO2Meter.com at **(877) 678-4259**. When requesting an RMA number, please provide the reason for return and original order number.

If we determine that the product failed due to improper use (water damage, dropping, tampering, electrical damage etc.) or abuse, or if it is beyond the warranty period, we will inform you of the cost to fix or replace your device.

If you are returning your device due to a warranty claim (with an RMA number) and you still have the unit original package, please use it to ship your unit to us. Please make sure to include the provided RMA number on the outside of the box, preferably on the shipping label. Make sure you secure the unit inside the package properly to prevent any damage during transit that could void your device's warranty. Finally, please ship your device to the address shown under the "Contact Us" section below. CO2Meter.com will not, under any circumstances, be responsible for your shipment expenses and no refund will be issued for shipping charges necessary for you to ship the unit to us.

Liability

All liabilities under this agreement shall be limited to the actual cost of the product paid to CO2Meter.com. In no event shall CO2Meter.com be liable for any incidental or consequential damages, lost profits, loss of time, lost sales or loss or damage to data, injury to person or personal property or any other indirect damages as the result of use of our products.

Contact Us

We are here to help!

If the troubleshooting guide above doesn't help you solving your problem or for more information, please contact us using the information below.

✉ support@co2meter.com

📞 (877) 678-4259 Toll free (M-F 9:00am–6:00pm EST)

🖨 (866) 422-2356

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